NALCO

Cerro Copper And Brass Co.
East St. Louis, Illinois

A2
N.D.
15411

FOUNDRY AREA

B&W Waste Heat and Cleaver Brooks Boilers:

The treatment program presently employed in this area is Nalco 749, Nalco 19 and caustic soda. Nalco 749 is a blend of polyphosphates for prevention of scale deposition, organics for sludge conditioning and catalyzed sodium sulfite for prevention of oxygen prevention. Nalco 19 is catalyzed sodium sulfite designed exclusively for removal of dissolved oxygen in the feedwater. This product was recommended for use in supplementing Nalco 749 until the deaerator system is operating efficiently.

The program will provide economical results if,
1) specified residuals are consistently maintained;
2) blowdown (intermittent and continuous) is controlled to maintain specified dissolved and suspended solids levels;
3) feedwater hardness is consistently less than 5 ppm.

We recommend duties such as treatment addition, blowdown, sampling and softener regeneration all be delegated to the same people. These people should coordinate closely with laboratory personnel regarding daily treatment, blowdown and regeneration recommendations based on sample testing.

Boiler Feedwater Deaerator:

Maximum oxygen removal is obtained when a supply of steam is continuous enough to maintain a temperature range of 220 to 225° F. in the reservoir (based on operating pressure of 3-5 psig). Present operating temperatures are in a range of 160 to 190° F.

The benefits associated with efficient deaerator operation are,
1) minimum oxygen pitting in deaerator reservoir and feedwater lines and pumps;
2) elimination of Nalco 19 as a supplemental oxygen scavenger.

Elgin and Hungerford-Terry Softeners:

As previously noted, the effectiveness and economy of the boiler water treatment program depends largely upon the quality

PRINTED IN U.S.A. 1-68 WG8324

NALCO CHEMICAL COMPANY
180 N. MICHIGAN AVENUE • CHICAGO, ILLINOIS 60601

of the softened feedwater.

Two (2) areas of concern presently exist in this area;

1) the Elgin softener is carrying the entire load. Consequently, during its regeneration cycle of approximately two (2) hours, hard city water goes to the boilers.
2) the Elgin softener is not consistently regenerated before its capacity is exhausted. This, of course, allows only partially softened water to supply the boilers.

When either of the above conditions exists, treatment costs increase because more Nalco 749 is required to react with and condition the excessive hardness. Also, fuel costs increase because increased blowdown is required for removal of the resultant sludge. More important, however, is the fact that increased treatment and blowdown necessary to cope with these conditions may come as much as 24 hours late. In this time period, there is the possibility of depleting chemical residuals and thus creating scale forming conditions in the boilers. It is our opinion that the scale on the boiler tubes presently has accumulated during periods of time in which scale forming conditions existed.

We understand that resin has been ordered for the Hungerford-Terry softener. We recommend that project be completed as soon as possible to eliminate further excessive chemical use and scale formation.

Also, we recommend regeneration of the Elgin softener based directly on gallonage and indirectly on tests.

In accomplishing this, the sampler would record and convey to laboratory personnel the meter reading each day of the softeners. The existing capacity of the softeners could soon be determined. With this information and daily meter readings, regeneration could be called out prior to exhaustion of the resin.

If the existing capacity of the Elgin softener is significantly less than that rated, the following steps can be taken to determine the cause:

1) Elution study (entails monitoring present regeneration techniques to determine flow rates during backwash, brining and rinse. Also, samples of effluent brine are taken to

PRINTED IN U.S.A. 1-68 WG8324

NALCO CHEMICAL COMPANY
180 N. MICHIGAN AVENUE • CHICAGO, ILLINOIS 60601

determine a brine concentration versus contact time curve.
2) Sample resin to determine if fouled and if so, the nature of the foulants. Determine amount, if any, of resin that needs to be replaced.

To eliminate human error in this vital area we recommend repair of the automatic regeneration equipment.

Foundry Area Cooling Water Systems:

The treatment program proposed for these cooling water systems is Nalco 360 and Nalco 345. Nalco 360 (ball form) inhibits corrosion in lines and equipment and Nalco 345 (liquid) prevents mineral scale deposition in the system and most importantly on high heat transfer surfaces.

In order to obtain maximum protection, the following must be accomplished;

1) Chromate level in system maintained at 25-35 ppm with Nalco 360.
2) Nalco 345 applied on a 1 to 1 ratio (by weight) to Nalco 360. For example, if five (5) Nalco 360 balls were required to treat the make-up required in one day, about 1/2 gallon of Nalco 345 should be applied to the system.
3) Application of Nalco 345 must be made on a continuous basis. This has effectively been done with drip feeders by dripping the amount required each day into the system over approximately that 24 hour period.

Test records indicate that these systems have not been adequately treated for at least three (3) to four (4) months. Corrosion rates and scale deposition probably have been high during this period.

We recommend immediate reinstitution of the program for all systems. Close coordination should be maintained between the personnel adding the treatment and the laboratory personnel.

A definite area of concern with respect to these towers are the low concentration levels that are maintained in these systems. The low levels are a result of system water losses resulting from overflow and leakage from pumps and lines.

PRINTED IN U.S.A. 1-68 WG8324

NALCO CHEMICAL COMPANY
180 N. MICHIGAN AVENUE • CHICAGO, ILLINOIS 60601

A definite area of concern with respect to these towers are the low concentration levels that are maintained in these systems. The low levels are a result of system water losses resulting from overflow and leakage from pumps and lines.

The present cooling water treatment is designed to give maximum protection against scale and corrosion at concentration ratios up to and including five (5) (based on city water make-up). Average ratios maintained in the Anode Furnace tower is two (2) and in the Building No. 19 tower is 1.5. Water treatment costs and make-up water costs at these low levels of concentration will be significantly higher than if recommended levels were maintained. Focusing on the Anode Furnace tower, the following example will further illustrate this point;

Recirculation Rate:	2000 gpm
Approximate Temperature Drop:	20° F.
Evaporation Rate:	40 gpm

Case I - 2 concentrations

Bleedoff or Loss Rate:	40 gpm
Total Make-up (evaporation rate and bleedoff or loss rate)	80 gpm

Case II - 5 concentrations

Bleedoff or Loss Rate:	10 gpm
Total Make-up (evaporation rate and bleedoff or loss rate)	50 gpm

The cost of city water and water treatment in Case I is 37.5% greater than Case II. Therefore, we recommend that steps be taken to increase the concentration levels to as near five (5) as possible.

PRINTED IN U.S.A. 1-68 WG8324

NALCO CHEMICAL COMPANY
180 N. MICHIGAN AVENUE • CHICAGO ILLINOIS 60601

MILL AREA

Mill Area Cooling Water Systems:

The program presently set up for the Mill Area cooling water systems employs a different philosophy than the Foundry Area program. The Mill Area program involves Nalco 360 for corrosion inhibition and sulfuric acid for pH control.

We recommend that the same program that is set up for the Foundry Area be instituted in all Mill Area systems. This recommendation is made primarily because of the handling hazards involved with acid and the difficulty associated with regulating pH between the required values of 7.0 and 7.5. These are the principal reasons Nalco has developed Nalco 345 and we feel the advantages gained far outweigh the slight increase in chemical cost of the program.

Control of specified levels of chromate in the Mill Area systems that are being treated has been fair, but control of pH has been poor. Consequently, scaling conditions have existed for at least three (3) to four (4) months according to test records. Particularly vulnerable areas are the compressor jackets and air after coolers.

The following systems should be treated with Nalco 360 and Nalco 345:

1) Main Mill compressor system
2) Extrusion Bay compressor systems
3) Heat Exchanger No. 1 system
4) Heat Exchanger No. 2 system
5) Induction Heater system (open recirculating)
6) Joy Air compressor system
7) B.A.F. No. 5 system
   (The latter two are not presently being treated in any manner)

As in the Foundry Area, the required amount of Nalco 345 should be dripped in over 24 hours. We recommend two gallon jugs with spigot drip feeders available from Fisher Scientific Company, Catalogue No. 2-963, at $11.00 each. A total of five (5) will be required. (Heat Exchangers No. 1 and 2 have adequate feed equipment as all treatment can be put into the adjacent overflow basins). Install the drip feeders on the catch basins of each system.

PRINTED IN U.S.A. 1-68 WG8324

NALCO CHEMICAL COMPANY
180 N. MICHIGAN AVENUE • CHICAGO, ILLINOIS 60601

All bleedoff valves and piping should be inspected and serviced to insure the ability to maintain specified concentration ratios.

Bright Annealing Boilers No. 2 and No. 3:

The design of the boilers does not lend itself to ordinary boiler water treatment. Therefore, at present, no regular treatment program is in effect.

The objection to ordinary boiler water treatment in these systems is that the sludge resulting from the intended reactions is not easily removed from the horizontal tube sheet. Continued build-up and reduction in heat transfer rates have resulted in several failures in past years.

In light of the stringent requirements on a treatment program, we recommend Nalco 345, the liquid cooling water treatment. This treatment when maintained in the boilers at the specified levels will prevent the hardness salts from precipitating. Consequently, sludge from reactions will be minimal.

We recommend applying Nalco 345 to the feedline with a chemical proportioning pump. This pump would be wired to operate simultaneously with the feedwater pump. It would be required to treat the make-up water.

There are several good chemical pumps on the market which would fit your needs. We have pertinent sizing data and price information. We will make this available to you or work with you in the pump selection.

The success of this program will depend greatly upon the quality of the zeolite softened make-up water. We suggest instituting a regeneration program similar to that of the Foundry Area softeners to insure feedwater less than 5 ppm hardness at all times.

Also, the dissolved solids levels must be carefully controlled with continuous and intermittent blowdown. This will insure avoidance of carryover in the steam that contaminates the condensate for the steam table.

PRINTED IN U.S.A. 1-68 WG8324

NALCO CHEMICAL COMPANY
180 N. MICHIGAN AVENUE • CHICAGO ILLINOIS 60601